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(54) A CONVEYOR DEVICE WITH A STRIPPER FOR HOLDING BACK MULTIPLE FLAT ARTICLES

(71) We, LICENTIA PATENT VERWALTUNGS G.m.b.H., of 1 Theodor-Stern-Kai, 6 Frankfurt/Main 70, Federal Republic of Germany, a German body corporate, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:

The invention relates to a conveyor device in which a conveyor element moves in the conveying direction on one side of the conveying path and a stripper is located on the other side of the conveying path.

Conveyor devices of this type are generally a component part of a device for dividing up flat articles from a stack or are used in conjunction with this device. However they are not fundamentally limited to this application.

In conveyor devices having the features stated in the preamble, it is particularly difficult, in the context of splitting up letters, to dimension the controlling force acting on the stripper so that the stripper operates reliably even when processing letters of very different properties. Thus, for example, it is possible that the controlling force may not be sufficient to prevent an additional letter being drawn past the stripper by one letter which has a particularly high entrainment capability, whereas a further increase in the controlling force is not possible because the entry of individual letters into the inlet region of the stripper would then be prevented.

The invention seeks to formulate a conveyor device such that multiple removals can be held back by the stripper with increased reliability even in unfavourable operating conditions.

According to the invention, there is provided a conveyor device for flat articles comprising a conveyor element moving in the conveying direction on one side of the conveying path and a stripper mounted on the other side of the conveying path, the stripper having a substantially flat surface facing the conveyor with a convexly curved portion at an inlet end thereof which is first encountered by articles arriving along the conveying direction at the stripper, a movable guide arm carrying the stripper so that the stripper is movable relative to the plane of the conveying path and biased towards it, the guide arm being pivotably connected to the stripper adjacent the end of the stripper remote from the said inlet end and biased such that the biasing force acts along a line falling between the pivot and the said inlet end of the stripper.

The invention will now be described in greater detail, by way of example, with reference to the drawings, in which:-

Figure 1 shows a separator for letters in plan view with a first embodiment of a conveyor device in accordance with the invention;

Figure 2 shows a partial section through the separator taken on the line II of Figure 1 on a larger scale;

Figure 3a shows a schematic plan view of the stripper used in Figure 1 in its position of rest;

Figures 3b c and *d* show plan views similar to Figure 3*a* but in various other phases of operation;

Figure 4 shows a modified refinement of the stripper shown above in a similar view to that of Figure 3;

Figure 5 shows a further refinement of the stripper in the same view as Figure 4, and

Figure 6 shows a second embodiment of a conveyor device in accordance with the invention in a view similar to Figure 1.

A stack of letters 2 is moved towards the separator element of the separator of Figures 1 and 2 along a guide wall 1 by means of known conveyor means (not shown). Six conveyor belts 3 running axially adjacent

with intermediate spacers serve as a separating element in accordance with Figure 2 for these letters and as a conveyor element within the framework of the device in accordance with the invention, these conveyor belts 3 being provided on their outer side cooperating with the letters with a friction coating. The operating surface 3' (Figure 2) of the conveyor element formed by the conveyor belts comprises six regions separated by intermediate spacers and adjacent each other. The conveyor belts 3 are passed over a roller 4 which can be driven in the direction of the arrow and a deflection roller 5, the axles 6 and 7 respectively of which are mounted on the baseplate 8. The roller 4 has six rolling surfaces 4' for accommodating the conveyor belts, which surfaces are separated from each other by annular grooves 4".

In following the conveyor path, the separated letters are taken over by two adjacent and driven conveyor belts 9 and 10 which are passed round the rollers 11 and 12 respectively.

Three strippers 13, each of which comprises a friction element 13' on a support element 13", serve to hold back double and multiple removals. As can be seen from Figure 1, each friction element has a substantially flat surface facing the conveyor, with a convexly curved position at an inlet end thereof by articles arriving at the stripper along the conveying direction as can be seen from Figure 2, each of the strippers is arranged at such a height that the end faces of the friction elements 13' acting on the letters are located opposite the intermediate space between two conveyor belts 3.

Each stripper 13 is carried by a guide arm 14 which in turn is pivotably mounted about an axle pin 15 fixed on the base plate 8. The connection between the guide arm 14 and the stripper 13 takes place by means of a pivot 16 arranged near the outlet region A of the stripper, i.e. at its rear end with respect to the direction of movement of the conveyor, said pivot 16 running parallel to the operating surfaces 3' of the conveyor belts 3 and having a certain spacing from the end surfaces of the friction elements 13' (see Figure 3*a*). The controlling force for the stripper 13 is produced by the cooperation of a first pressure spring 17 engaging the guide arm 14 and a second pressure spring 18 effective near the inlet region (front end) E of the stripper between the stripper and the guide arm. The pressure spring 17 is supported by a plate 19 which is fixed to a rigid stand 21 by means of a threaded pin 20 so as to be adjustable. The springs 17 and 18 are not shown to scale in Figures 1 and 6.

In the intermediate space between the relevant conveyor belts 3 a support finger 22' lies opposite each stripper 13, the finger 22' being located on the same side of the conveyor path as the conveyor belts. As a rigid extension, the support finger is part of an arm 22 which is pivotally mounted on an axle 23 fixed to the baseplate 8. In accordance with the number of strippers, for example, three of these arms 22 are arranged one on top of the other the uppermost being visible in Figure 1. A tension spring 25 hooked on to a common stud 24 engages each arm. Furthermore, a sensing roller 26 is freely rotatably mounted on each arm. The arms 22 are supported by these sensing rollers at the point which can be seen from Figure 1 on the operating surface 3' of the conveyor belt 3 which is above it in each case, so that any change caused by wear in the thickness of the conveyor belt and thus in the position of its operating surface is transmitted to the support finger 22'. In this way, the mutual position of the operating surfaces 3' of the conveyor belts 3 and of the end face of the friction element 13' of the related stripper 13, which surface faces the conveyor belts on the other hand remain unchanged despite wear of the conveyor belts and the friction coating.

The mode of operation of the stripper 13 of the separator of Figures 1 and 2 can be seen from the schematic views of the Figure parts a) to d) of Figure 3:

In accordance with Figure 3*a* a letter 2*a* may be drawn off from the stack 2 by the conveyor belts 3, a further letter 2*b* being carried along by it as a result of the mutual friction. The stripper 13 is still located in its position of rest in which it rests against the support finger 22' in the plane of the operating surface 3' (Figure 1).

When the letters run against the inlet region E of the stripper 13, the latter is moved away by the letter 2*a* against the force of the second spring 18 as shown in Figure 3*b*. Thus it is pivoted about the axle 16. Since the spring 18 is effective between the stripper 13 and the guide arm 14 while it rests on the latter the force of the first spring 17 effective via the axis 16 on the outlet region A of the stripper is reduced in accordance with the lever ratios at the guide arm 14.

In Figure 3*c* the letter 2*a* has now reached the outlet region A of the stripper 13. Thus in the inlet region E a further force gains in influence in addition to the force of the spring 18 which arises from the fact that a torque is produced around the axle 16 owing to friction between the letter 2*a* and the stripper 13 in the outlet region on the stripper.

This additional pressing force in the inlet region E of the stripper 13 is still effective in the phase of operation shown in Figure 3*d* in which only the rear edge of the letter 2*a* is

still located in the outlet region A. Only after it has passed out of the stripper does the fricion related torque disappear around the axle 16 and thus the additional force also disappears in the inlet region so that inlet of the leading edge of the letter 2*b* is no longer made difficult. The same operating conditions are present then as before in Figure 3*a*.

In Figure 4 in further schematic view, a similar stripper 13 is shown as in Figure 3*a*. It can be seen that the controlling force acting on the stripper is formed by a first force 17′ engaging the guide arm 14 and by a second force 18′ which engages the stripper near the inlet region E and thus produces a torque in the sense of a controlling force effective in the inlet region with respect to its axle 16. If the force 18′ can be supported on the guide arm 14 as in the special embodiment of Figures 1 to 3 it could be implemented also by a rotary spring engaging between the stripper 13 and the guide arm.

By comparison of Figures 4 and 5, it can be seen that within the framework of the invention the forces 17′ and 18′ can be replaced by a correspondingly dimensioned resultant force 27 without changing the mechanical properties of the overall arrangement, the force 27 engaging the stripper 13 in a region lying between the axle 16 and the inlet region E of the stripper 13.

In the embodiment of the invention shown in Figures 1 to 3, the stripper 13 abuts support fingers 22′, but this feature is not essential to the invention, for example, Figure 6 shows an embodiment in which the stripper is held by rigid stops at a predetermined small spacing from the plane of the operating surface 3′ of conveyor belts 3. The stripper or strippers can then be arranged at the same level as are the conveyor belts, in contrast to Figure 2.

The guide arm 14 of the stripper 13 of Figure 6 is provided with a stop surface 14′ which cooperates with an adjustable stop 28 fixed to the baseplate 8. Thus the position of rest of the guide arm and of the axle 16 can be defined. A rod 29, which engages the stripper with the aid of an axle 30 and is supported by an adjustable nut 31 on the guide arm serves to adjust the position of the stripper with respect to the guide arm.

WHAT WE CLAIM IS:-

1. A conveyor device for flat articles comprising a conveyor element moving in the conveying direction on one side of the conveying path and a stripper mounted on the other side of the conveying path, the stripper having a substantially flat surface facing the conveyor, with a convexly curved portion at an inlet end thereof which is first encountered by articles arriving along the conveying direction at the stripper, a movable guide arm carrying the stripper so that the stripper is movable relative to the plane of the conveying path and biased towards it, the guide arm being pivotably connected to the stripper adjacent the end of the stripper remote from the said inlet end and biased such that the biasing force acts along a line falling between the pivot and the said inlet end of the stripper.

2. A conveyor device according to claim 1, in which the biasing means is such as to apply a first biasing force to the guide arm and a second biasing force which produces a torque on the stripper about its pivotal connection to the guide arm.

3. A conveyor device according to claim 2, in which the second biasing force is produced by a spring which engages the stripper adjacent the inlet end thereof.

4. A conveyor device according to claim 2 or claim 3, in which the second biasing force is applied between the guide arm and the stripper.

5. A conveyor device substantially as described herein with reference to the drawings.

For the Applicants.
J.F. WILLIAMS & CO.,
Chartered Patent Agents,
34 Tavistock Street,
London WC2.

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1592241 COMPLETE SPECIFICATION

3 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

Sheet 1

FIG.1

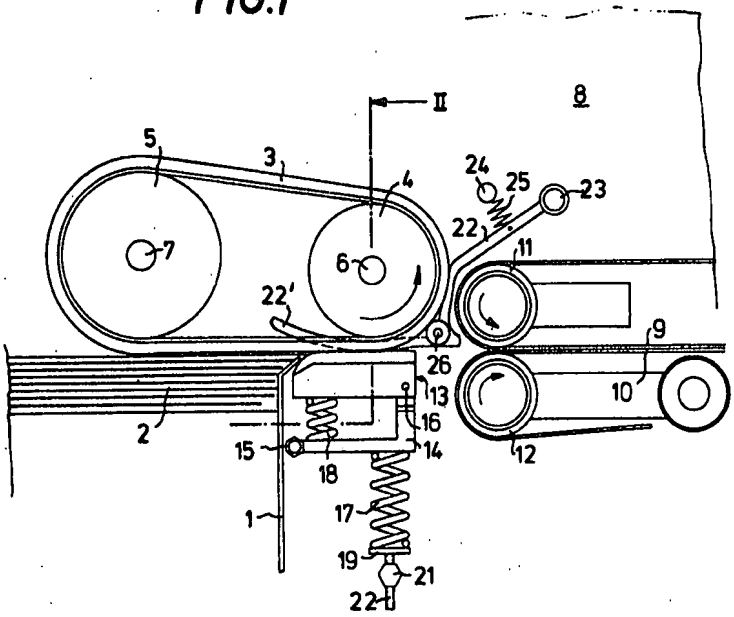
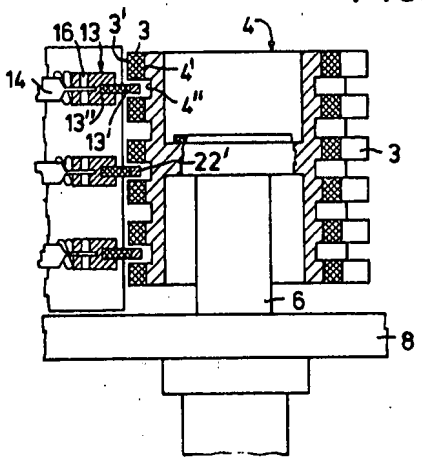
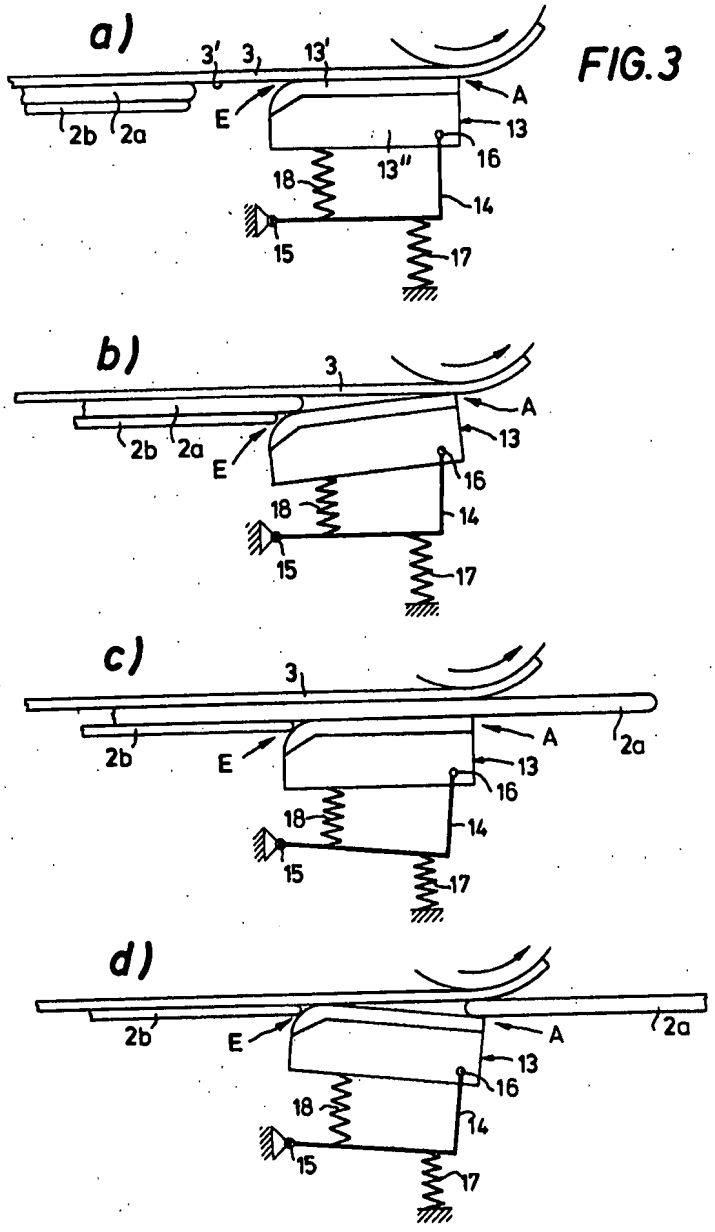


FIG. 2

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d)
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FIG.3

1592241 COMPLETE SPECIFICATION
3 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 3

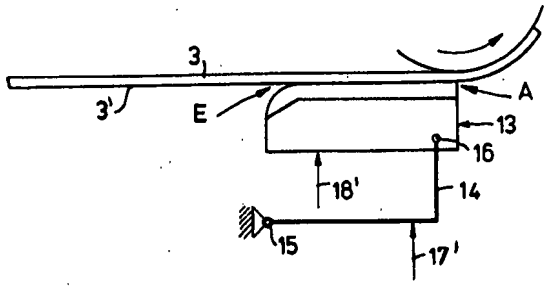

FIG.4

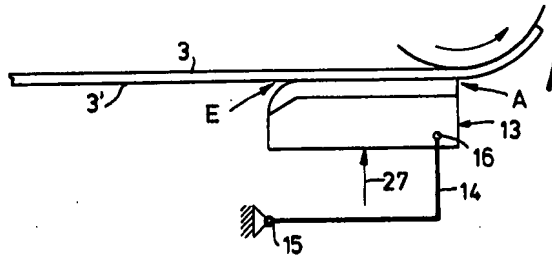

FIG.5

FIG.6